Association Layer that receives a plurality of the Fourier series in Fourier space including at least one ordered Fourier series from the memory and forms a string comprising a sum of the Fourier series and stores the string in memory. The system also includes a String Ordering Layer that receives the string from memory and orders the Fourier series contained in the string to form an ordered string and stores the ordered string in memory. The system also includes a Predominant Configuration Layer that receives multiple ordered strings from the memory, forms complex ordered strings comprising associations between the ordered strings, and stores the complex ordered strings to the memory. The components of the system are active based on probability using weighting factors based on activation rates.- -

B1

Replace the paragraph on page 2, line 15 through page 4, line 10, with the following paragraph:

B2

- - Another aspect of the present invention is directed to ordering a string representing the information. This aspect of the invention utilizes a High Level Memory section of the memory that maintains an initial set of ordered Fourier series. This aspect of the invention includes obtaining a string from the memory and selecting at least two filters from a selected set of filters stored in the memory. This aspect also includes sampling the string with the filters such that each of the filters produce a sampled Fourier series. Each Fourier series comprises a subset of the string. This aspect also includes modulating each of the sampled Fourier series in Fourier space with the corresponding selected filter such that each of the filters produce an order formatted Fourier series. Furthermore, this aspect includes adding the order formatted Fourier series produced by each filter to form a summed Fourier series in Fourier space, obtaining an ordered Fourier series from the memory, determining a spectral similarity between the summed Fourier series and the ordered Fourier series, determining a probability expectation value based on the spectral similarity, and generating a probability operand having a value selected from a set of zero and one, based on the probability expectation value. These steps are repeated until the probability operand has a value of one. Once the probability operand has a value of one, this aspect includes storing the summed Fourier series to an

intermediate memory section. Thereafter, this aspect includes removing the selected filters from the selected set of filters to form an updated set of filters, removing the subsets from the string to obtain an updated string, and selecting an updated filter from the updated set of filters. This aspect further includes sampling the updated string with the updated filter to produce a sampled Fourier series comprising a subset of the string, modulating the sampled Fourier series in Fourier space with the corresponding selected updated filter to produce an updated order formatted Fourier series, recalling the summed Fourier series from the intermediate memory section, adding the updated order formatted Fourier series to the summed Fourier series to form an updated summed Fourier series in Fourier space, and obtaining an updated ordered Fourier series from the memory. This aspect further includes determining a spectral similarity between the updated summed Fourier series and the updated ordered Fourier series, determining a probability expectation value based on the spectral similarity, and generating a probability operand having a value selected from a set of zero and one, based on the probability expectation value. These steps are repeated until the probability operand has a value of one or all of the updated filters have been selected from the updated set of filters. If all of the updated filters have been selected before the probability operand has a value of one, then clearing the intermediate memory section and repeating the steps starting with selecting at least two filters from a selected set of filters. Once the probability operand has a value of one, the updated summed Fourier series is stored to the intermediate memory section and steps beginning with removing the selected filters from the selected set of filters to form an updated set of filters are repeated until one of the following set of conditions is satisfied: the updated set of filters is empty or the remaining subsets of the string is nil. If the remaining subsets of the string is nil, then the Fourier series in the intermediate memory section is stored in the High Level Memory section of the memory.- -

Replace the paragraph on page 13, lines 1-26, with the following paragraph:

- - Referring again to Figure 2, several parameterized Fourier components are input to the Association Layer to form associations of the Fourier series. The Fourier components may be stored in a Fourier component section 30 of a temporary memory section 28. The Fourier components are added to form multiple Fourier series which in turn may be stored in a Fourier series section 32 of the temporary memory section 28. At least one of the Fourier series stored in the Fourier series section 32 is input to a filter 34 wherein the filter 34 samples and modulates the Fourier series. The filtered Fourier series is input to a spectral similarity analyzer 36. The spectral similarity analyzer 36 determines the spectral similarity between the filtered Fourier series and another Fourier series stored in the Fourier series section 32 of the temporary memory section 28. A spectral similarity value is output from the spectral similarity analyzer 36 and input to a probability expectation analyzer 38. The probability expectation analyzer 38 determines a probability expectation value based on the spectral similarity value. The probability expectation value output from the probability expectation analyzer 38 is input to a probability operand generator 40. The probability operand generator 40 generates a probability operand value of one or zero based upon the probability expectation value. The probability operand value is output to a processor 42. If the probability operand value is zero, the processor 42 sends another Fourier series from the Fourier series section 32 of the temporary memory section 28 to the filter 34 and begins the process again. If the probability operand value is one, the filtered Fourier series and the other Fourier series are added to form a string and the string is stored in a string memory section 44.- -

Replace the paragraph on page 13, line 27 through page 15, line 8, with the following paragraph:

- -The filter 34 can be a time delayed Gaussian filter in the time domain. The filter may be characterized in time by:

$$\frac{\alpha}{\sqrt{2\pi}} e^{\frac{\left(t-\frac{\sqrt{N}}{\alpha}\right)^2}{\frac{2}{\alpha^2}}}$$

wherein $\frac{\sqrt{N}}{\alpha}$ is a delay parameter, $\alpha$ is a half-width parameter, and $t$ is the time parameter. The Gaussian filter may comprise a plurality of cascaded stages each stage having a decaying exponential system function between stages. The filter, in frequency space, can be characterized by:

$$e^{-\frac{1}{2}\left(\frac{2\pi f}{\alpha}\right)^2} e^{-j\sqrt{N}\left(\frac{2\pi f}{\alpha}\right)}$$

wherein $\frac{\sqrt{N}}{\alpha}$ and $\alpha$ are a corresponding delay parameter and a half-width parameter in time, respectively, and $f$ is the frequency parameter. The probability distribution may be Poissonian. Thus, the probability expectation value can be based upon Poissonian probability. The probability expectation value may be characterized by

$$\prod_s \left[ p_{\uparrow_s} + \left(P - p_{\uparrow_s}\right) \exp\left[ -\beta_s^{-2} \left( \frac{1 - \cos 2\phi_s}{2} \right) \right] \cos\left(\delta_s + 2 \sin \phi_s\right) \right]$$

wherein $P$ is the maximum probability of at least one other Fourier series being associated with a first Fourier series, $p_{\uparrow_s}$ is a probability of at least one other Fourier series being associated with a first Fourier series in the absence of coupling of the first Fourier series with the at least one other Fourier series, $\beta_s^2$ is a number that represents the amplitude of spectral similarity between at least two filtered or unfiltered Fourier series, $\phi_s$ represents the frequency difference angle between at least two filtered or unfiltered Fourier series, and $\delta_s$, is a phase factor. $\beta_s^2$ may be characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}}$$

$$\sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s} \exp - \left\{ \frac{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2} \left( \frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}} - \frac{N_{m_s} \rho_{0_{m_s}}}{2 v_{m_s}} \right)^2}{2} \right\}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, $\alpha_1$ and $\alpha_s$ corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, $M_1$ and $M_s$ are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, $v_{m_1}$ and $v_{m_s}$ are constants such as the signal propagation velocities, and $N_{m_1}$, $N_{m_s}$, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters. The data parameters are selected in the same manner as described above. $\phi_s$ may be characterized by

$$\phi_s = \frac{\pi \left( \frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1} \frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}} - \sum_{m_s=1}^{M_s} \frac{N_{m_s} \rho_{0_{m_s}}}{2 v_{m_s}} \right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1} \frac{N_{m_1} \rho_{0_{m_1}}}{2 v_{m_1}}}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, $\alpha_1$ and $\alpha_s$ corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, $M_1$ and $M_s$ are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, $v_{m_1}$ and $v_{m_s}$ are constants such as the signal propagation velocities, and $N_{m_1}$, $N_{m_s}$, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters. The data parameters are selected in the same manner as described above. - -

B4

Replace the paragraph on page 15, line 19 through page 16, line 12, with the following paragraph:

B5

- - An exemplary string with each Fourier series multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ that established the association to form the string is:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho 0}} N_{s,m_{z0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ and $v_{sz0}$ are constants such as the signal propagation velocities in the $\rho$ and $z$ directions, respectively, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and $\alpha_{s\rho 0}$ and $\alpha_{sz0}$ are half-width parameters of a corresponding Gaussian filter in the $\rho$ and $z$ directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, $k_\rho$ and $k_z$ are the frequency variables, $n$, $m$, $s$, $M_s$, and $S$ are integers, and $N_{s,m_{\rho 0}}$, $N_{s,m_{z0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters. The data parameters are selected in the same manner as described above.- -

Replace the paragraph on page18, line 23 through page 19, line 12, with the

following paragraph:

- - Each filter of the set of filters can be a time delayed Gaussian filter having a half-width parameter $\alpha$ which determines the amount of the string that is sampled. Each filter of the set of filters can be a time delayed Gaussian filter having a delay parameter $\frac{\sqrt{N}}{\alpha}$ which corresponds to a time point. Each Fourier series of the ordered string can be multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$. The filter established the correct order. The ordered string can be represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ and $v_{sz0}$ are constants such as the signal propagation velocities in the $\rho$ and $z$ directions, respectively, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and $\alpha_{s\rho 0}$ and $\alpha_{sz0}$ are half-width parameters of a corresponding Gaussian filter in the $\rho$ and $z$ directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, $k_\rho$ and $k_z$ are the frequency variables, $n$, $m$, $s$, $M_s$, and $S$ are integers, and $N_{s,m_{\rho 0}}$, $N_{s,m_{z0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters. The data parameters are selected in the same manner as described above.- -

Replace the paragraph on page 46, lines 1-21, with the following paragraph:

- - i.) in one analog embodiment, the output $V_{\sum_m}$ in Fourier space is the "string" given by Eq. (37.113) comprising the superposition of $S$ "groups of SFCs" wherein each "SFCs" corresponds to the response of $M$ "M or P elements", with input context. In another embodiment, the output $V_{\sum_m}$ is the "string" of Eq.

(37.114)

$$V_{\sum_{s,m}}\left(k_\rho, k_z\right)=\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2}e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}\left(v_{s\rho 0}k_\rho\right)}e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2}e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}\left(v_{sz0}k_z\right)}$$
$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right) \quad (37.114)$$

wherein each "SFCs" is multiplied by the Fourier transform of the delayed Gaussian filter (Eq. (37.50)) (i.e. the modulation factor $e^{-\frac{1}{2}\left(v_{s,m}\frac{k_\rho}{\alpha}\right)^2}e^{-j\sqrt{N}\left(v_{s,m}\frac{k_\rho}{\alpha}\right)}e^{-\frac{1}{2}\left(v_{s,m}\frac{k_z}{\alpha}\right)^2}e^{-j\sqrt{N}\left(v_{s,m}\frac{k_z}{\alpha}\right)}$) which gave rise to "coupling" and "association" to form the "string". In the digital case, the output $V_{\sum_m}$ in Fourier space is the "string" given by Eq. (37.113) comprising the superposition of $S$ "groups of SFCs" wherein each "SFCs" corresponds to a matrix digitized according to Eq. (37.110), with input context. In another embodiment of the digital case, the output $V_{\sum_m}$ is the "string" of Eq. (37.114) wherein each "SFCs" corresponds to a matrix digitized according to Eq. (37.110) that is multiplied by a digitized matrix according to the Fourier transform of the delayed Gaussian filter (Eq. (37.50)) which gave rise to the "coupling" and "association" to form the "string".- -

Replace the paragraph on page 49, lines 3-21, with the following paragraph:

- - The output of an association filter is the convolution of the input "groups of SFCs" ( each "SFCs" is given by Eqs. (37.33) and (37.33a)) of a "string" (Eq. 37.108) or the string itself with a delayed Gaussian. In terms of the matrix method of analysis (hereafter "MMA"), the filter parameter $\alpha$ of the time delayed Gaussian filter corresponds to the acquisition of the composition of a polynucleotide member of a nested set of subsets. The time delay (time domain) and modulation (frequency domain) parameter $\frac{\sqrt{N}}{\alpha}$ determines the center of mass of the output, and it corresponds to the terminal nucleotide data. By forming "associations" with input from "High Level Memory", the "processor" determines the relative position of the center of mass of each Fourier series such as a "group of SFCs" as either "before" or "after" the center of mass of the preceding and succeeding Fourier series "associated" with Fourier series input from "High Level Memory". The complete set of Fourier series "associated" with Fourier series input from "High Level Memory" covers all of the

frequencies of the "string". By Parseval's theorem, by processing the entire interval in $k,\omega$ −space, the information is entirely processed in the time domain. The order such as temporal order of the Fourier series representing information is determined using the MMA.- -

B8

Replace the paragraph on page 49, line 31 through page 50, line 27, with the following paragraph:

- - Input to form "associations" is provided by changing the decay constant $\alpha$ and the number of "stages" in the cascade $N$, or by processing "a SFCs" of a "string" using an "association ensemble" with different parameters $\alpha$ and $N$ over all "groups of SFCs" that make up the entire "string". Each "group of SFCs" is determined to be on the $t=t_i$-side or the $t=t_f$-side of the "axis" of the "string" corresponding to the 5'-side or 3'-side of the "axis" of a polynucleotide to be sequenced via the Matrix Method of Analysis. A feedback loop comprises sequentially switching to different "known", "set", or "hardwired" delayed Gaussian filters which corresponds to changing the decay constant, $\alpha_s$, with a concomitant change in the half-width parameter, $\alpha_s$, and the number of elements, $N_s$, with a concomitant change in the delay, $\frac{\sqrt{N_s}}{\alpha_s}$, where each $\alpha_s$ and $\frac{\sqrt{N_s}}{\alpha_s}$ is "known" from past experiences and associations. The feedback loop whereby information from memory encoded in the "string" is filtered and delayed (modulated and sampled in frequency space) to provide "FCs", "SFCs" or "groups of SFCs" which are "associated" with input from "High Level Memory" provides the data acquisition and processing equivalent to the formation, acquisition, and analysis of the composition and terminal nucleotide data of a set of "sequential subsets" of the Matrix Method of Analysis. Changing the filters which process the "string" corresponds to changing the "guess" of the "known" nucleotides, $K_1K_2K_3K_4\cdots K_{n'}$, as well as the "unknown" nucleotides, $X_1,X_2,X_3,X_4\cdots$, of the Matrix Method of Analysis as applied to DNA sequencing. The order of the "groups of SFCs" of the "string" is established when "associations" with the "High Level Memory" are achieved for a given set of delayed Gaussian filters. Then each Fourier series of the ordered "string" is recorded to the "High Level Memory" wherein each Fourier series of the ordered "string" may be multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz 0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz 0}}}{\alpha_{sz0}}(v_{sz 0}k_z)}$ that established the correct order to form the ordered "string". The total output response

B9

$V_{\sum\limits_{m}}$ in Fourier space comprising the superposition of $S$ "groups of SFCs" wherein each "SFCs" corresponds to the response of $M$ "M or P elements", with input context, is the "string" given by Eq. (37.113).- -

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Replace the paragraph on page 52, lines 5-14, with the following paragraph:

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B10

- - h.) the "groups of SFCs" of the " P string" of the form of Eqs. (37.113-37.115) that are parameterized according to their relative order are recorded to the "High Level Memory". For example, each Fourier series of the ordered string is recorded to the "High Level Memory" wherein each Fourier series of the ordered "string" is multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ that established the correct order to form the ordered "string" represented by

$$V_{\sum\limits_{s,m}}(k_\rho, k_z) = \sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty} a_{0_{s,m}} N_{s,m_{\rho_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-jk_\rho \rho_{f0_{s,m}}} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)$$

(37.115).- -

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Replace the two paragraphs from page 82, line 27 through page 84, line 9, with the following two paragraphs:

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B11

- - The output of an association filter is the convolution of the input "groups of SFCs" (each "SFCs" given by Eqs. (37.33) and (37.33a)) of a "string" (Eq. 37.108) or the "string" itself with a delayed Gaussian. In terms of the matrix method of analysis (hereafter "MMA"), the filter parameter $\alpha$ of the time delayed Gaussian filter corresponds to the acquisition of the composition of a polynucleotide member of a nested set of subsets. The time delay (time domain) and modulation (frequency domain) parameter $\frac{\sqrt{N}}{\alpha}$ determines the center of mass of the output, and it corresponds to the terminal nucleotide data. By forming "associations" with input from "High Level Memory" as given in SUB-APPENDIX III--Association Mechanism and Basis of Reasoning, the "processor" determines the relative position of the center of mass of each Fourier series such as a "group of SFCs" as either "before" or "after" the center of mass of the preceding and succeeding Fourier series "associated" with Fourier series input from "High Level Memory". The complete set of Fourier series "associated" with Fourier series input from "High Level Memory" covers all of the

frequencies of the "string". By Parseval's theorem, by processing the entire interval in $k,\omega-$space, the information is entirely processed in the time domain. The order such as temporal order of the Fourier series representing information is determined using the MMA.

B1

Input to form associations is provided by changing the decay constant $\alpha$ and the number of "stages" in the cascade $N$, or by processing each "group of SFCs" of a "string" using an "association ensemble" with different parameters $\alpha$ and $N$ over all "groups of SFCs" that make up the entire "string". Each "group of SFCs" is determined to be on the $t=t_i$-side or the $t=t_f$-side of the "axis" of the "string" corresponding to the 5'-side or 3'-side of the "axis" of a polynucleotide to be sequenced via the Matrix Method of Analysis. A feedback loop comprises sequentially switching to different "known", "set", or "hardwired" delayed Gaussian filters which corresponds to changing the decay constant, $\alpha_s$, with a concomitant change in the half-width parameter, $\alpha_s$, and the number of elements, $N_s$, with a concomitant change in the delay, $\frac{\sqrt{N_s}}{\alpha_s}$, where each $\alpha_s$ and $\frac{\sqrt{N_s}}{\alpha_s}$ is "known" from past experiences and associations. The feedback loop whereby information from memory encoded in the "string" is filtered and delayed (modulated and sampled in frequency space) to provide "FCs", "SFCs" or "groups of SFCs" which are associated with input from "High Level Memory" provides the data acquisition and processing equivalent to the formation, acquisition, and analysis of the composition and terminal nucleotide data of a set of "sequential subsets" of the Matrix Method of Analysis. Changing the filters which process the "string" corresponds to changing the "guess" of the "known" nucleotides, $K_1K_2K_3K_4\cdots K_{n'}$, as well as the "unknown" nucleotides, $X_1,X_2,X_3,X_4\cdots$, of the Matrix Method of Analysis as applied to DNA sequencing. The order of the "groups of SFCs" of the "string" is established when "associations" with the "High Level Memory" are achieved for a given set of delayed Gaussian filters (i.e. the order of Fourier series representing information is solved when internal consistence is achieved according to the MMA). Then each Fourier series of the ordered "string" is recorded to the "High Level Memory" wherein each Fourier series of the ordered "string" may be multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ that established the correct order to form the ordered "string".- -

Replace the two paragraphs on page 99, line 10 through page 101, line 26, with the following two paragraphs:

B10

-- "Associations" are established between Fourier series such as "SFCs" and "groups of SFCs" (i.e. a "string" is created) by "coupling" with Poissonian probability between "association ensembles" "carrying" the "SFCs" and "groups of SFCs". Input context is encoded by the transducer frequency band modulation factor $e^{-jk_\rho\left(\rho_{fbs,m}+\rho_{ts,m}\right)}$ according to Eq. (37.110). In this case, Eq. (37.87b) is

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}} \sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s}$$
$$\exp-\left\{ \frac{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}\left(\frac{\sqrt{N_1}}{\alpha_1}-\frac{\sqrt{N_s}}{\alpha_s}+\left(\frac{N_{m_1}t_{0_{m_1}}}{2}+t_{fb_{m_1}}+t_{t_{m_1}}\right)-\left(\frac{N_{m_s}t_{0_{m_s}}}{2}+t_{fb_{m_s}}+t_{t_{m_s}}\right)\right)^2}{2} \right\}$$

(37.111a)

And, Eq. (37.87c) is

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}} \sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s}$$
$$\exp-\left\{ \frac{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}\left(\frac{\sqrt{N_1}}{\alpha_1}-\frac{\sqrt{N_s}}{\alpha_s}+\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}}+\frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}}+\frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)-\left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}}+\frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}}+\frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)^2}{2} \right\}$$

(37.111b)

The corresponding frequency difference angle, $\phi_s$, which follows from Eq. (37.89) is

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1}-\frac{\sqrt{N_s}}{\alpha_s}+\sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}}+\frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}}+\frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)-\sum_{m_s=1}^{M_s}\left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}}+\frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}}+\frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)}{\frac{\sqrt{N_1}}{\alpha_1}+\sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}}+\frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}}+\frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)}$$

(37.112a)

The corresponding frequency difference angle, $\phi_s$, which follows from Eq. (37.90) is

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}t_{0_{m_1}}}{2} + t_{fb_{m_1}} + t_{t_{m_1}}\right) - \sum_{m_s=1}^{M_s}\left(\frac{N_{m_s}t_{0_{m_s}}}{2} + t_{fb_{m_s}} + t_{t_{m_s}}\right)\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}t_{0_{m_1}}}{2} + t_{fb_{m_1}} + t_{t_{m_1}}\right)} \tag{37.112b}$$

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Eq. (37.108), the "read" total response $V_{\sum_m}$ in Fourier space comprising the superposition of $S$ "SFCs" wherein each "SFCs" corresponds to the response of $M_s$ "M or P elements", with input context encoded by the modulation factor $e^{-jk_\rho\left(\rho_{fb_{s,m}} + \rho_{t_{s,m}}\right)}$, becomes the following "string".

$$V_{\sum_{s,m}}(k_\rho, k_z) = \sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty} \frac{4\pi}{1 + \frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-jk_\rho\left(\rho_{fb_{s,m}} + \rho_{t_{s,m}}\right)}$$
$$\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right) \tag{37.113}$$

where $\rho_{t_{s,m}} = v_{t_{s,m}} t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$ and $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$. $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities. In another embodiment, the output $V_{\sum_m}$ is the Gaussian sampled and modulated "string" of Eq. (37.113) wherein each "SFCs" is multiplied by the Fourier transform of the delayed Gaussian filter (Eq. (37.50)) (i.e. the modulation factor $e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$) which gave rise to "coupling" and "association" to form the "string". $V_{\sum_m}$ is given by

$$V_{\sum_{s,m}}(k_\rho, k_z) = \sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty} \frac{4\pi}{1 + \frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$
$$e^{-jk_\rho\left(\rho_{fb_{s,m}} + \rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right) \tag{37.114}$$

wherein input context is encoded by the modulation factor $e^{-jk_\rho\left(\rho_{fb_{s,m}} + \rho_{t_{s,m}}\right)}$. Eq. (37.114) is also an exemplary "string" with each Fourier series multiplied by the Fourier transform of the delayed Gaussian filter represented by